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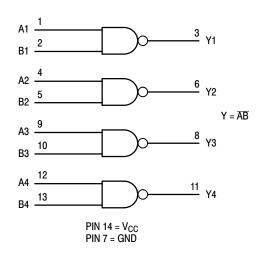
# **Quad 2-Input NAND Gate**

# High-Performance Silicon-Gate CMOS

# МС74АС00, МС74АСТ00

# Features

- Output Drive Capability: ±24 mA
- Operating Voltage Range: 2 to 6 V AC00; 4.5 to 5.5 ACT00
- Low Input Current: 1.0 µA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 32 FETs
- These are Pb-Free Devices



## Figure 1. Logic Diagram

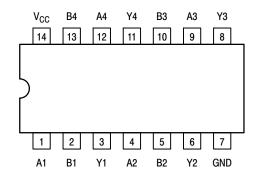
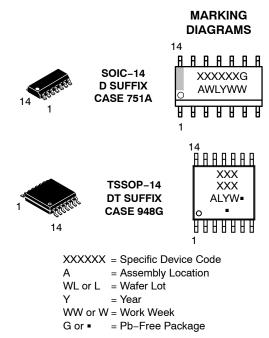


Figure 2. Pinout: 14-Lead Packages (Top View)



(Note: Microdot may be in either location)

#### **FUNCTION TABLE**

Inp	Inputs			
Α	в	Y		
L	L	Н		
L	н	н		
Н	L	н		
н	Н	L		

## **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

### **MAXIMUM RATINGS**

Symbol	Parameter		Value	Unit
V <sub>CC</sub>	DC Supply Voltage		-0.5 to +6.5	V
VI	DC Input Voltage		$-0.5 \leq V_I \leq V_{CC} + 0.5$	V
Vo	DC Output Voltage	(Note 1)	$-0.5 \leq V_O \leq V_{CC} + 0.5$	V
I <sub>IK</sub>	DC Input Diode Current		±20	mA
I <sub>OK</sub>	DC Output Diode Current		±50	mA
I <sub>O</sub>	DC Output Sink/Source Current		±50	mA
I <sub>CC</sub>	DC Supply Current per Output Pin		±50	mA
I <sub>GND</sub>	DC Ground Current per Output Pin		±50	mA
T <sub>STG</sub>	Storage Temperature Range		-65 to +150	°C
TL	Lead temperature, 1 mm from Case for 10 Second	nds	260	°C
TJ	Junction temperature under Bias		+ 150	°C
$\theta_{JA}$	Thermal Resistance (Note 2)	SOIC TSSOP	116 150	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 25°C	SOIC TSSOP	1077 833	mW
MSL	Moisture Sensitivity		Level 1	
F <sub>R</sub>	Flammability Rating Oxy	gen Index: 30% – 35%	UL 94 V-0 @ 0.125 in	
V <sub>ESD</sub>		n Body Model (Note 3) Device Model (Note 4)	> 2000 > 1000	V
I <sub>Latch-Up</sub>	Latch-Up Performance Above V <sub>CC</sub> and Below	GND at 85°C (Note 5)	±100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

I<sub>O</sub> absolute maximum rating must be observed.
 The package thermal impedance is calculated in accordance with JESD51–7.

Tested to EIA/JESD22-A114-A.
 Tested to JESD22-C101-A.

5. Tested to EIA/JESD78.

## **RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter		Min	Тур	Max	Unit
V <sub>CC</sub>	Supply Voltage	MC74AC00 MC74ACT00	2.0 4.5	5.0 5.0	6.0 5.5	V
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Ref. to GND)		0	-	V <sub>CC</sub>	V
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 6) MC74AC00	V <sub>CC</sub> @ 3.0 V V <sub>CC</sub> @ 4.5 V V <sub>CC</sub> @ 5.5 V	- - -	150 40 25	- - -	ns/V
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 7) MC74ACT00	V <sub>CC</sub> @ 4.5 V V <sub>CC</sub> @ 5.5 V		10 8.0	-	ns/V
TJ	Junction Temperature		-	-	150	°C
T <sub>A</sub>	Operating Ambient Temperature Range		-55	25	125	°C
I <sub>OH</sub>	Output Current – High		-	-	-24	mA
I <sub>OL</sub>	Output Current – Low		_	-	24	mA

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

6.  $V_{in}$  from 30% to 70% V<sub>CC</sub>. 7.  $V_{in}$  from 0.8 V to 2.0 V.

### **DC CHARACTERISTICS**

					MC74AC00			
		v <sub>cc</sub>	T <sub>A</sub> = +	-25°C	$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	T <sub>A</sub> = -55°C + 125°C		
Symbol	Parameter	(V)	Тур		Guaranteed	Limits	Unit	Conditions
V <sub>IH</sub>	Minimum High Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	2.1 3.15 3.85	2.1 3.15 3.85	2.1 3.15 3.85	V	$V_{OUT} = 0.1 V$ or $V_{CC} - 0.1 V$
V <sub>IL</sub>	Maximum Low Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	0.9 1.35 1.65	0.9 1.35 1.65	0.9 1.35 1.65	V	$V_{OUT} = 0.1 V$ or V <sub>CC</sub> – 0.1 V
V <sub>OH</sub>	Minimum High Level Output Voltage	3.0 4.5 5.5	2.99 4.49 5.49	2.9 4.4 5.4	2.9 4.4 5.4	2.9 4.4 5.4	V	I <sub>OUT</sub> = -50 μA
		3.0 4.5 5.5	- - -	2.56 3.86 4.86	2.46 3.76 4.76	2.4 3.7 4.7	V	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$
V <sub>OL</sub>	Maximum Low Level Output Voltage	3.0 4.5 5.5	0.002 0.001 0.001	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V	I <sub>OUT</sub> = 50 μA
		3.0 4.5 5.5	- - -	0.36 0.36 0.36	0.44 0.44 0.44	0.5 0.5 0.5	V	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	-	±0. 1	±1.0	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND
I <sub>OLD</sub>	†Minimum Dynamic	5.5	-	_	75	50	mA	V <sub>OLD</sub> = 1.65 V Max
I <sub>OHD</sub>	Output Current	5.5	-	-	-75	-50	mA	V <sub>OHD</sub> = 3.85 V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	-	4.0	40	40	μA	$V_{IN} = V_{CC}$ or GND

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions. \*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time. NOTE:  $I_{IN}$  and  $I_{CC}$  @ 3.0 V are guaranteed to be less than or

equal to the respective limit @ 5.5 V  $V_{CC}$ .

# AC CHARACTERISTICS ( $t_r = t_f = 3.0 \text{ nS}$ ; $C_L = 50 \text{ pF}$ ; see Figures 3 and 4 for Waveforms)

				MC74AC00						
		v <sub>cc</sub> *	T <sub>A</sub> = +25°C		T <sub>A</sub> = +25°C		$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$		T <sub>A</sub> = -55°C to + 125°C	
Symbol	Parameter	(V)	Min	Тур	Max	Min	Max	Min	Max	Unit
t <sub>PLH</sub>	Propagation Delay	3.3 5.0	2.0 1.5	7.0 6.0	9.5 8.0	2.0 1.5	10.0 8.5	1.0 1.0	11.0 8.5	ns
t <sub>PHL</sub>	Propagation Delay	3.3 5.0	1.5 1.5	5.5 4.5	8.0 6.5	1.0 1.0	8.5 7.0	1.0 1.0	9.0 7.0	ns

\*Voltage Range 3.3 V is 3.3 V  $\pm$  0.3 V. Voltage Range 5.0 V is 5.0 V  $\pm$  0.5 V.

### **DC CHARACTERISTICS**

					MC74ACT00			
		v <sub>cc</sub>	T <sub>A</sub> = +	-25°C	$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	T <sub>A</sub> = −55°C to + 125°C		
Symbol	Parameter	(V)	Тур		Guaranteed	Limits	Unit	Conditions
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	2.0 2.0	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> – 0.1 V
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	0.8 0.8	V	$V_{OUT} = 0.1 V$ or $V_{CC} - 0.1 V$
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	4.4 5.4	V	I <sub>OUT</sub> = -50 μA
		4.5 5.5		3.86 4.86	3.76 4.76	3.7 4.7	V	$\label{eq:VIN} \begin{array}{ll} *V_{IN} = V_{IL} \text{ or } V_{IH} \\ I_{OH} & -24 \text{ mA} \\ -24 \text{ mA} \end{array}$
V <sub>OL</sub>	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	0.1 0.1	V	I <sub>OUT</sub> = 50 μA
		4.5 5.5		0.36 0.36	0.44 0.44	0.5 0.5	V	$V_{IN} = V_{IL} \text{ or } V_{IH}$ $I_{OL}$ 24 mA 24 mA
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	±1.0	μΑ	$V_{I} = V_{CC}, GND$
$\Delta I_{CCT}$	Additional Max. I <sub>CC</sub> /Input	5.5	0.6	-	1.5	1.6	mA	$V_{I} = V_{CC} - 2.1 V$
I <sub>OLD</sub>	†Minimum Dynamic	5.5	-	-	75	50	mA	V <sub>OLD</sub> = 1.65 V Max
I <sub>OHD</sub>	Output Current	5.5	-	-	-75	-50	mA	V <sub>OHD</sub> = 3.85 V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	-	4.0	40	40	μΑ	$V_{IN} = V_{CC}$ or GND

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions. \*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one output loaded at a time.

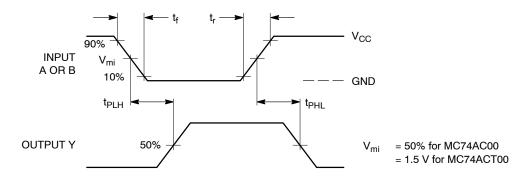
# AC CHARACTERISTICS ( $t_r = t_f = 3.0 \text{ nS}$ ; $C_L = 50 \text{ pF}$ ; see Figures 3 and 4 for Waveforms)

			MC74ACT00							
		V <sub>CC</sub> *	T,	<sub>4</sub> = +25°	С	T <sub>A</sub> = -40°C	C to +85°C	T <sub>A</sub> = -55°C	to +125°C	
Symbol	Parameter	(V)	Min	Тур	Max	Min	Max	Min	Max	Unit
t <sub>PLH</sub>	Propagation Delay	5.0	1.5	5.5	9.0	1.0	9.5	1.0	9.5	ns
t <sub>PHL</sub>	Propagation Delay	5.0	1.5	4.0	7.0	1.0	8.0	1.0	8.0	ns

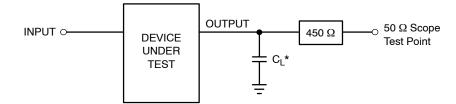
\*Voltage Range 5.0 V is 5.0 V  $\pm 0.5$  V.

# CAPACITANCE

Symbol	Parameter	Value Typ	Test Conditions	Unit
C <sub>IN</sub>	Input Capacitance	4.5	V <sub>CC</sub> = 5.0 V	pF
C <sub>PD</sub>	Power Dissipation Capacitance	30	V <sub>CC</sub> = 5.0 V	pF







\*Includes all probe and jig capacitance

Figure 4. Test Circuit

### ORDER INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
MC74AC00DG	AC00	SOIC-14 (Pb-Free)	55 Units / Rail
MC74AC00DR2G	AC00	SOIC-14 (Pb-Free)	
MC74AC00DTR2G	AC 00	TSSOP-14 (Pb-Free)	– 2500 / Tape and Reel
MC74ACT00DG	ACT00	SOIC-14 (Pb-Free)	55 Units / Rail
MC74ACT00DR2G	ACT00	SOIC-14 (Pb-Free)	
MC74ACT00DTR2G	ACT 00	TSSOP-14 (Pb-Free)	2500 / Tape and Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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\*For additional information on our Pb–Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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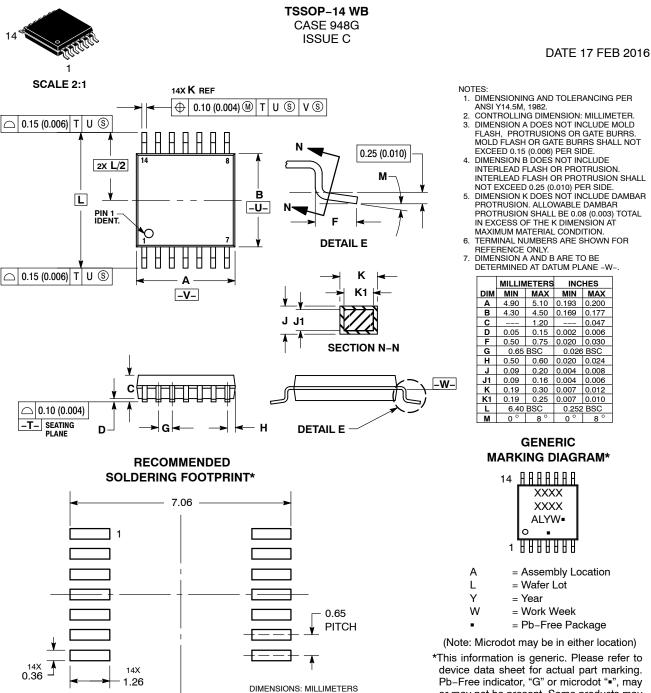
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STYLE 1: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. NO CONNECTION 5. ANODE/CATHODE 6. NO CONNECTION 7. ANODE/CATHODE 8. ANODE/CATHODE 9. ANODE/CATHODE 10. NO CONNECTION 11. ANODE/CATHODE 12. ANODE/CATHODE 13. NO CONNECTION 14. COMMON ANODE	STYLE 2: CANCELLED	STYLE 3: PIN 1. NO CONNECTION 2. ANODE 3. ANODE 4. NO CONNECTION 5. ANODE 6. NO CONNECTION 7. ANODE 8. ANODE 9. ANODE 10. NO CONNECTION 11. ANODE 12. ANODE 13. NO CONNECTION 14. COMMON CATHODE	STYLE 4: PIN 1. NO CONNECTION 2. CATHODE 3. CATHODE 4. NO CONNECTION 5. CATHODE 6. NO CONNECTION 7. CATHODE 8. CATHODE 10. NO CONNECTION 11. CATHODE 12. CATHODE 13. NO CONNECTION 14. COMMON ANODE
STYLE 5: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. ANODE/CATHODE 5. ANODE/CATHODE 6. NO CONNECTION 7. COMMON ANODE 8. COMMON CATHODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. ANODE/CATHODE 12. ANODE/CATHODE 13. NO CONNECTION 14. COMMON ANODE	STYLE 6: PIN 1. CATHODE 2. CATHODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE 7. CATHODE 8. ANODE 9. ANODE 10. ANODE 11. ANODE 12. ANODE 13. ANODE 14. ANODE	STYLE 7: PIN 1. ANODE/CATHODE 2. COMMON ANODE 3. COMMON CATHODE 4. ANODE/CATHODE 5. ANODE/CATHODE 6. ANODE/CATHODE 7. ANODE/CATHODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. COMMON CATHODE 12. COMMON CATHODE 13. ANODE/CATHODE 14. ANODE/CATHODE	STYLE 8: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. NO CONNECTION 5. ANODE/CATHODE 6. ANODE/CATHODE 7. COMMON ANODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. NO CONNECTION 12. ANODE/CATHODE 13. ANODE/CATHODE 14. COMMON CATHODE

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\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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